Poster

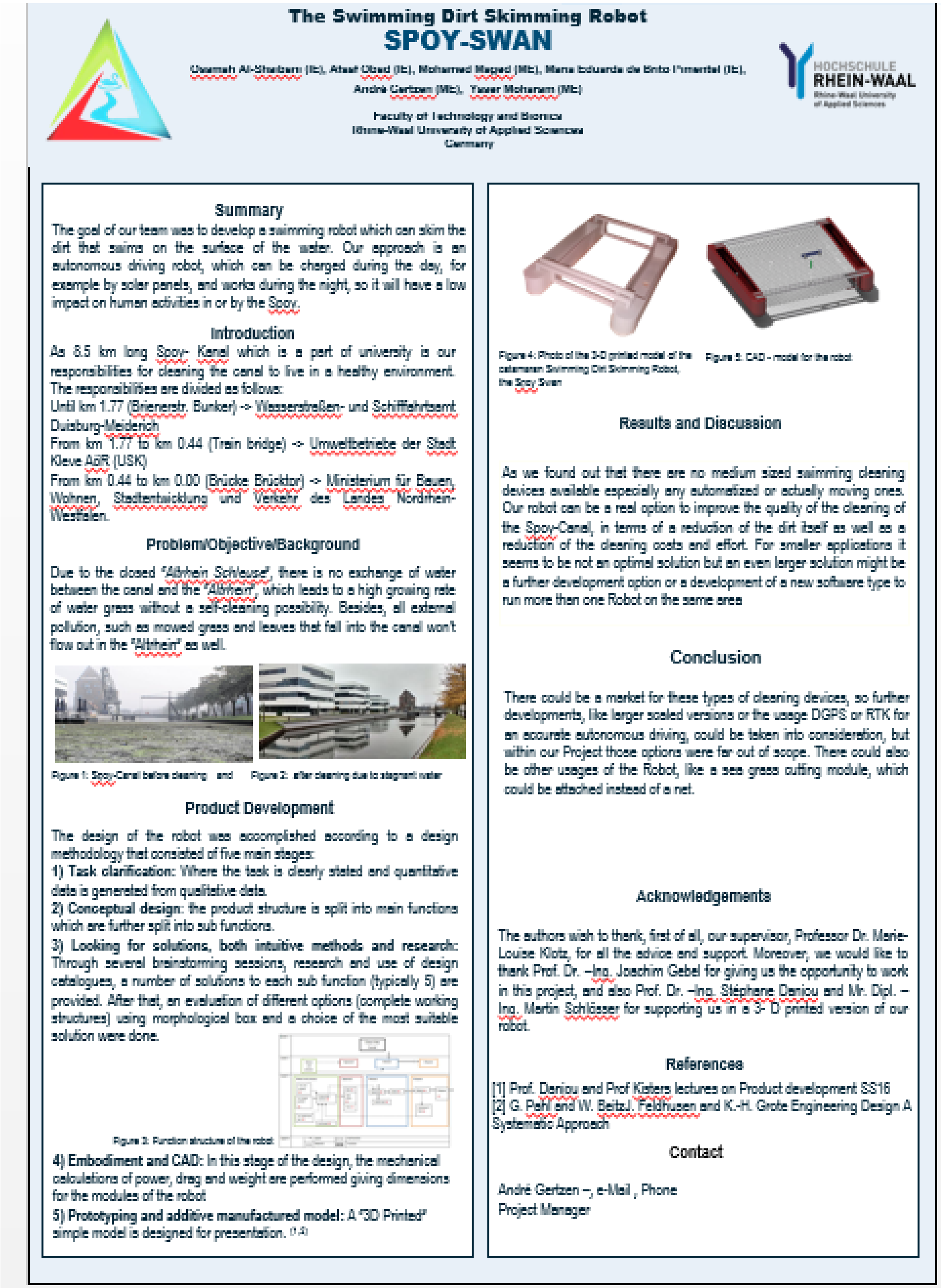
A Poster will be another option to present the research results in a complex and short version.

This will be requested by scientific conferences in addition to a talk or even without talk. In front of the poster you will explain your research and the results. Maybe interested scientists or industry people may have comments or are interested to cooperate with you or they will cite your research in their publication what is highly appreciated by all scientist as well by a young researcher.

This is a proof for your research quality.

A Poster should contain all important aspects but in a very short and dense form because the space is limited.

Besides the reader has not so much time to read!



The Swimming Dirt Skimming Robot
SPOY-SWAN

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Summary
The goal of our team was to develop a swimming robot which can skim the dirt that swims on the surface of the water. Our approach is an autonomous driving robot, which can be charged during the day, for example by solar panels, and works during the night, so it will have a low impact on human activities in or by the Spoy.

Introduction
As 8.5 km long Spoy- Kanal which is a part of university is our responsibilities for cleaning the canal to live in a healthy environment. The responsibilities are divided as follows:
Until km 1.77 (Brienerstr. Bunker) -> Wasserstraßen- und Schiffahrtsamt Duisburg-Meiderich
From km 1.77 to km 0.44 (Train bridge) -> Umweltbetriebe der Stadt Kleve AöR (USK)
From km 0.44 to km 0.00 (Brücke Brücktor) -> Ministerium für Bauen, Wohnen, Stadtentwicklung und Verkehr des Landes Nordrhein-Westfalen.

Problem/Objective/Background
Due to the closed "Altrhein Schleuse", there is no exchange of water between the canal and the "Altrhein", which leads to a high growing rate of water grass without a self-cleaning possibility. Besides, all external pollution, such as mowed grass and leaves that fall into the canal won't flow out in the "Altrhein" as well.

Figure 1: Spoy-Canal before cleaning and Figure 2: after cleaning due to stagnant water

Product Development
The design of the robot was accomplished according to a design methodology that consisted of five main stages:
1) **Task clarification:** Where the task is clearly stated and quantitative data is generated from qualitative data.
2) **Conceptual design:** the product structure is split into main functions which are further split into sub functions.
3) **Looking for solutions, both intuitive methods and research:** Through several brainstorming sessions, research and use of design catalogues, a number of solutions to each sub function (typically 5) are provided. After that, an evaluation of different options (complete working structures) using morphological box and a choice of the most suitable solution were done.

Figure 3: Function structure of the robot

4) **Embodiment and CAD:** In this stage of the design, the mechanical calculations of power, drag and weight are performed giving dimensions for the modules of the robot
5) **Prototyping and additive manufactured model:** A "3D Printed" simple model is designed for presentation. [1,2]

Figure 4: Photo of the 3-D printed model of the catamaran Swimming Dirt Skimming Robot, the Spoy Swan

Figure 5: CAD - model for the robot

Results and Discussion
As we found out that there are no medium sized swimming cleaning devices available especially any automatized or actually moving ones. Our robot can be a real option to improve the quality of the cleaning of the Spoy-Canal, in terms of a reduction of the dirt itself as well as a reduction of the cleaning costs and effort. For smaller applications it seems to be not an optimal solution but an even larger solution might be a further development option or a development of a new software type to run more than one Robot on the same area

Conclusion
There could be a market for these types of cleaning devices, so further developments, like larger scaled versions or the usage DGPS or RTK for an accurate autonomous driving, could be taken into consideration, but within our Project those options were far out of scope. There could also be other usages of the Robot, like a sea grass cutting module, which could be attached instead of a net.

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References
[1] Prof. Daniou and Prof Kisters lectures on Product development SS16
[2] G. Pahl and W. Beitz,J. Feldhusen and K.-H. Grote Engineering Design A Systematic Approach

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Example for a Poster

Important is the most interesting information are presented,

Short, clear, summarized, easy to check
The design is just an example. It might be that your institution, your company will have a special design which you have to take as well.
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